II International Scientific Practical Conference – Central Asia water forum

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ICBA
AGRICULTURE FOR TOMORROW

ICBA's Story Since 1999

Focus on *salinity for irrigated agriculture* OIC Countries

Expanded to include *integrated water resource management*

Increase *food nutrition, water security and resilience* in marginal environments

1999 — 2004 — 2012

Problems & Challenges

- Environmental degradation
- groundwater depletion and drought
- Soil salinity (natural and induced salinization)
- Water scarsity

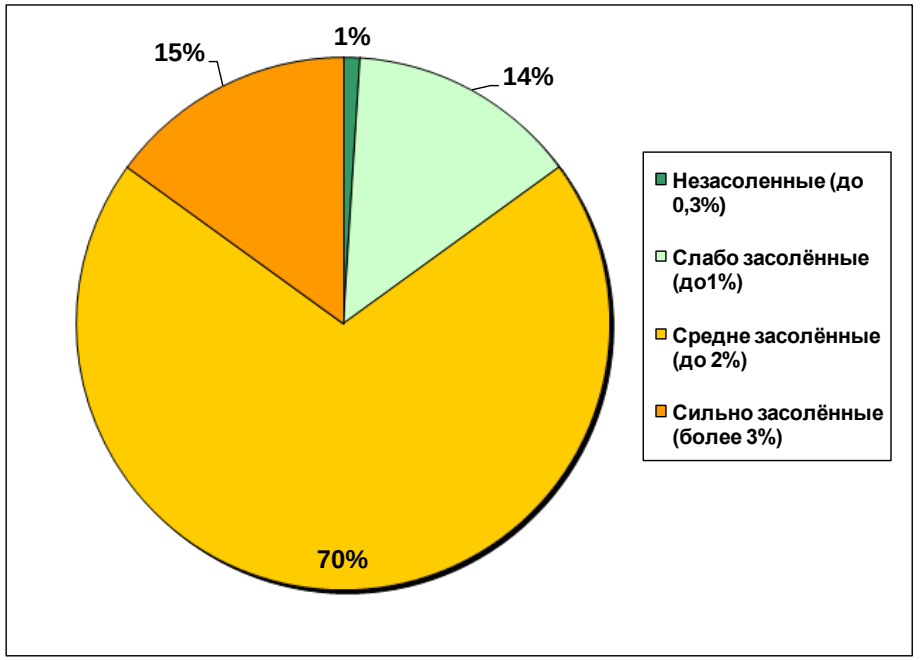
marginalized population:

- unemployment > 30 % (ILO) & limited access to decision-making, natural resources, and finances

Annual salt accumulation in the soils - 10-30 t/ha.

For last 10 years stable trend of cotton and wheat yields decreasing is observed (for example cotton yield doesn't exceed 1,6 t/ha)

Karakalpakstan (irrigated agricultural zone)



Salt affected irrigated lands lower stream of Amydarya (Karakalpakstan & Khoresm region):

1990 - 1,16 mln.ha

2000 - 1,82 mln.ha (57%)

2012 - 4,43 mln ha (more than 70%)

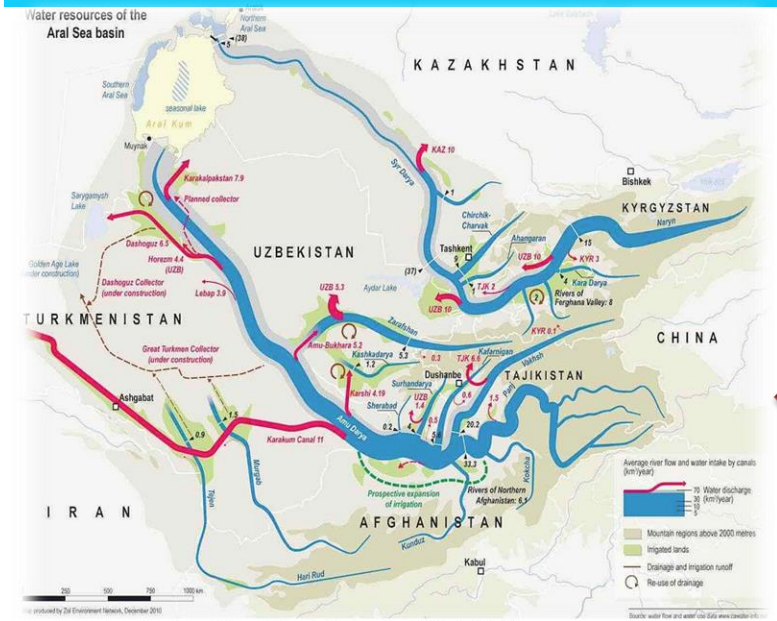
Irrigated lands with shallow water table less than 1,5 m from total agricultural lands:

- more than 80% in Khorezm

- about 20% in Karakalpakstan

Recent collaborative work of ICBA in CAC countries

Promotion & Adoption of Best Practices at Regional/Local Community/or village level



http://www.flickr.com/photos/zoienvironment/7525832184/in/photostream

Marginal environments:

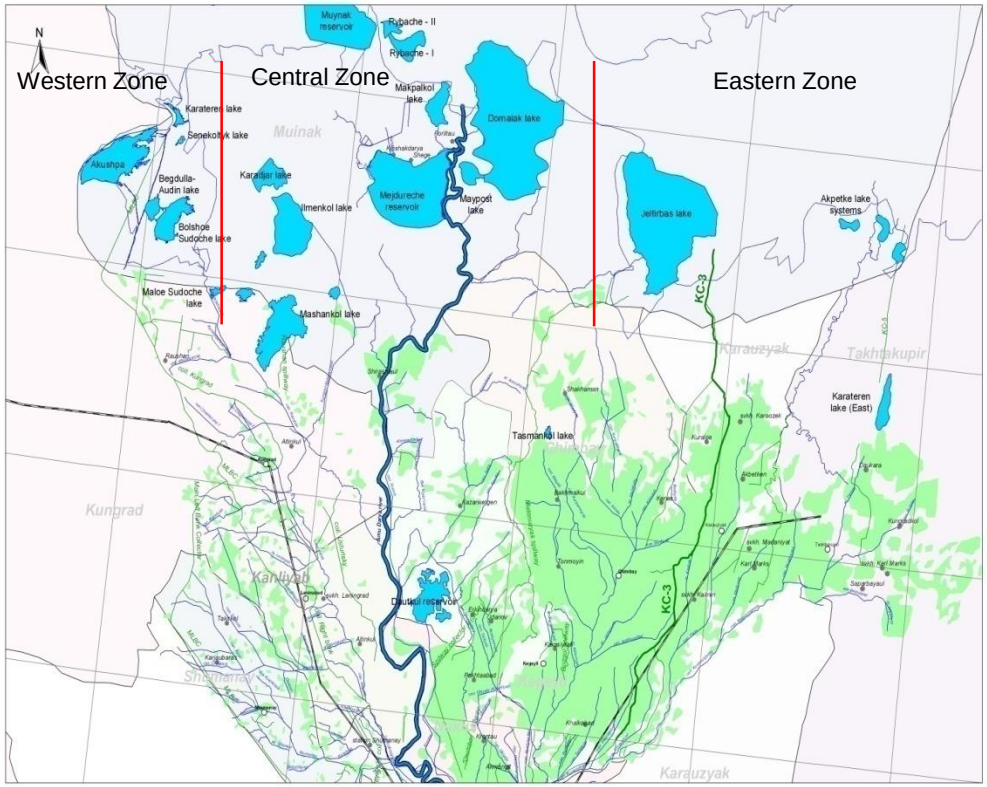
- Agricultural salt effected areas
- Rangelands/pastures
- Abandoned salt effected lands (solonchaks)

ICBA TECHOLOGIES *PRODUCTS for up-and out scaling*

BEST BIOSALINE PACKAGES:

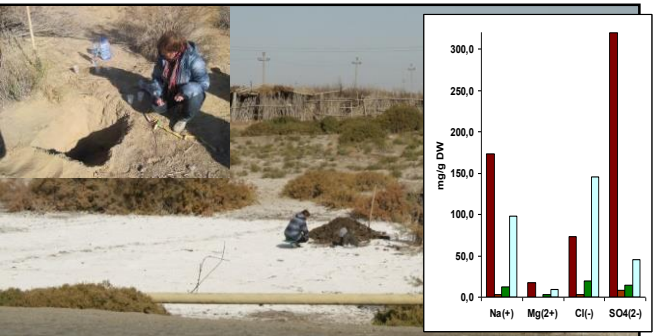
- Agroforestry/Afforestation
- Alley-cropping system/ Mixed farming
- Rangelands grazing & Livestock re-stoking program
- Pastures value chain & livestock feeding system (oasis agro-livestock mini-cooperatives)
- Halophytes for fodder, food, medicinal and energy
- Crop diversification (introduction of non-conventional salt tolerant crops & halophytes)
- Soil desalination using halophytes (phytoremediation)

Towards Improving Water/Food Security from Marginal Lands- Alternative Options for Agriculture In AMRB



Survey and documentation of non conventional land resources: salt affected, waterlogged, abandoned) and waters (drainage effluents, saline water, mineralized artesian wells) in environmentally vulnerable areas

Priority: finding solution/options to manage root zone salt crusts (content of toxic salts - 18-58%)



Weather station-based irrigation advisory system fine-tuned and operationalized for most-predominant hydro-module zone in Karakalpkastan (HMZ)

Spatial distribution map of salt-affected soil typs in Karauzyak district

Legend

- Water body
- WUA boundary(Irrigated land)

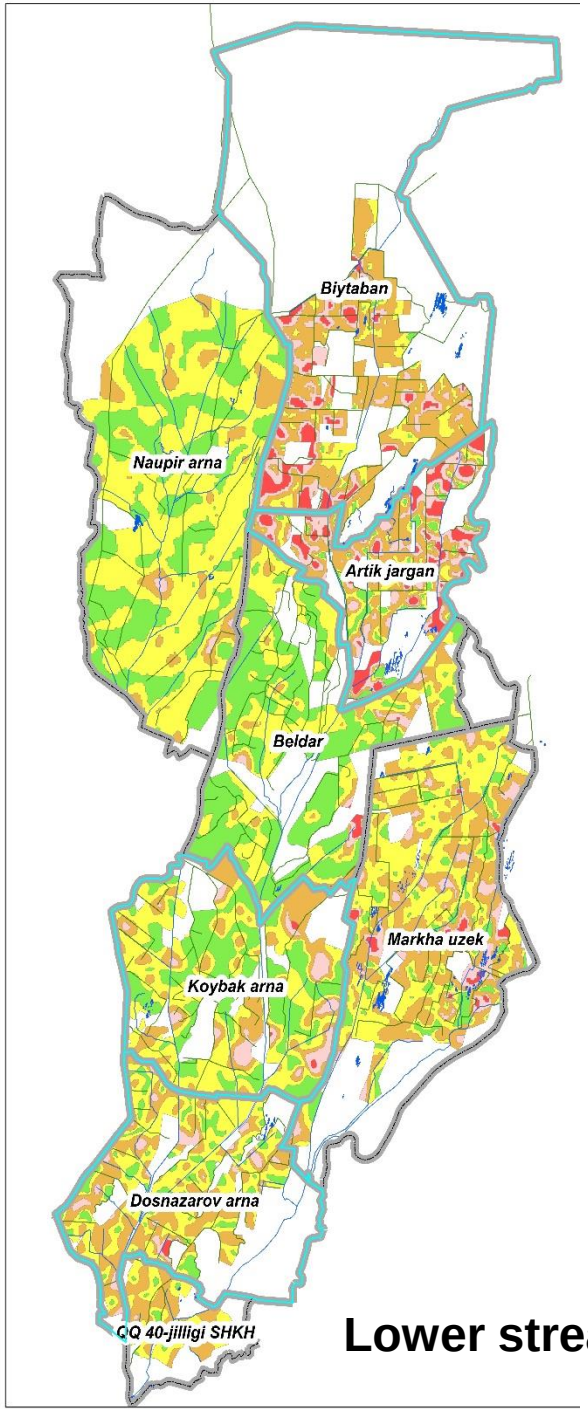
Irrigation network

- collectors
- kanals

Salinity

TYP

- Strong salinity
- High salinity
- Medium salinity
- Low salinity
- No salinity



Spatial distribution map of salt-affected soil typs in Karauzyak district

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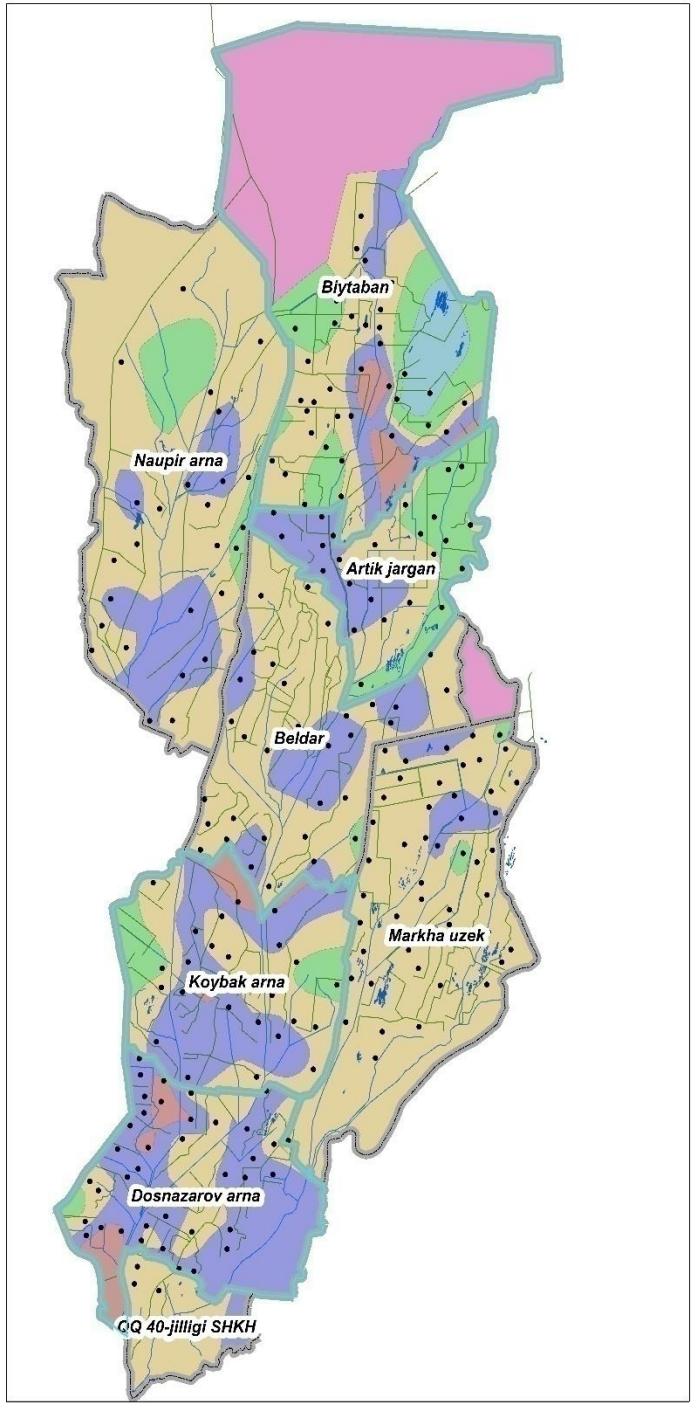


Lower stream sub-basin

Amudarya - middle stream (Second sub-basin)

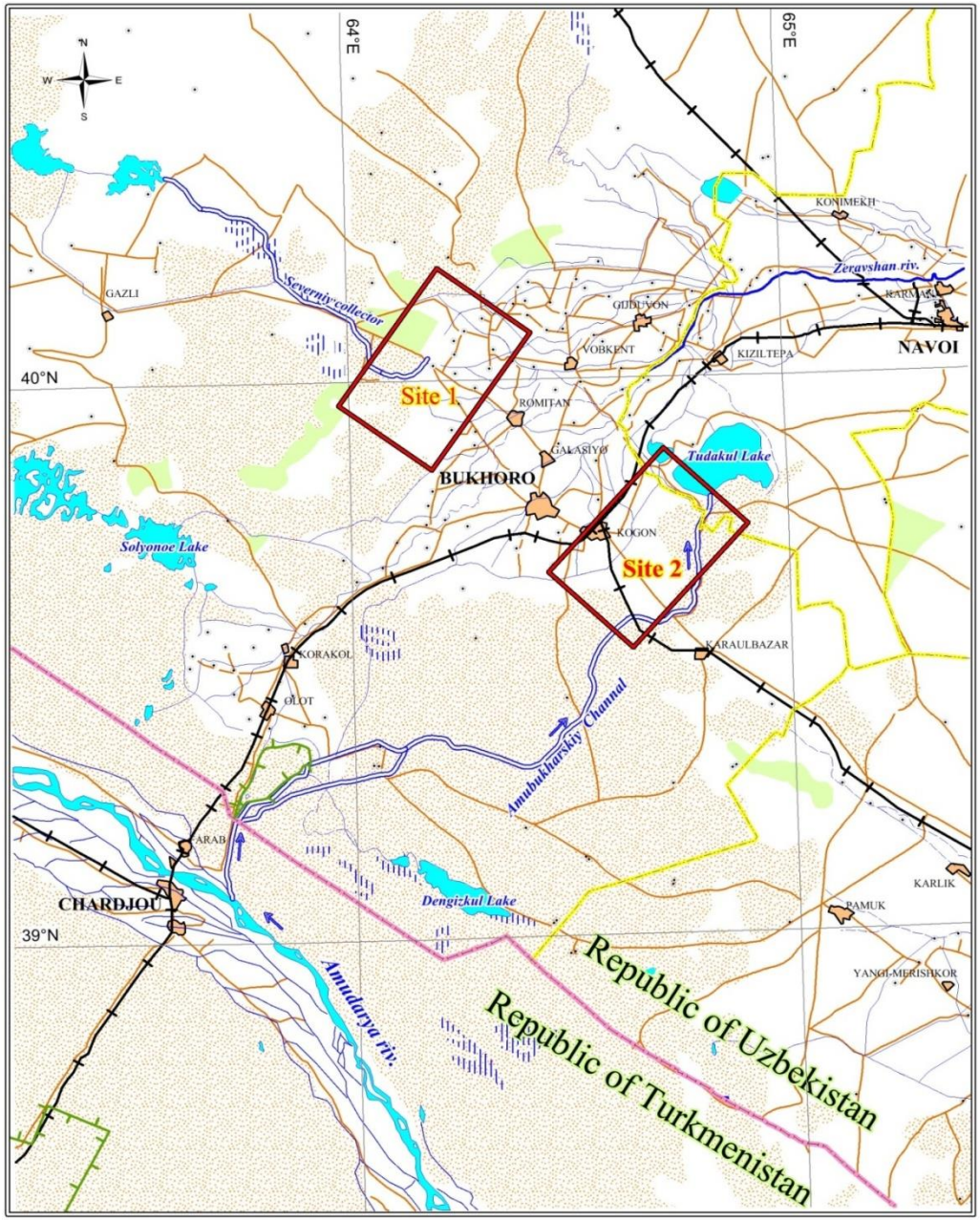
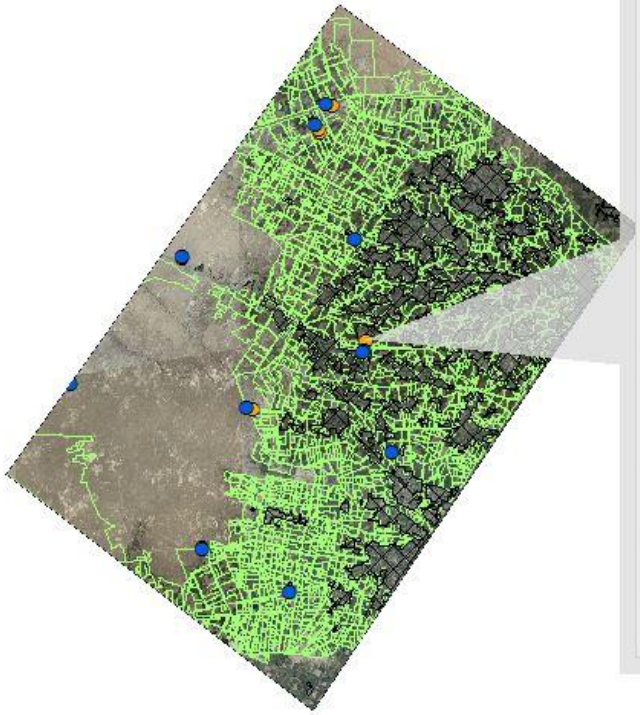


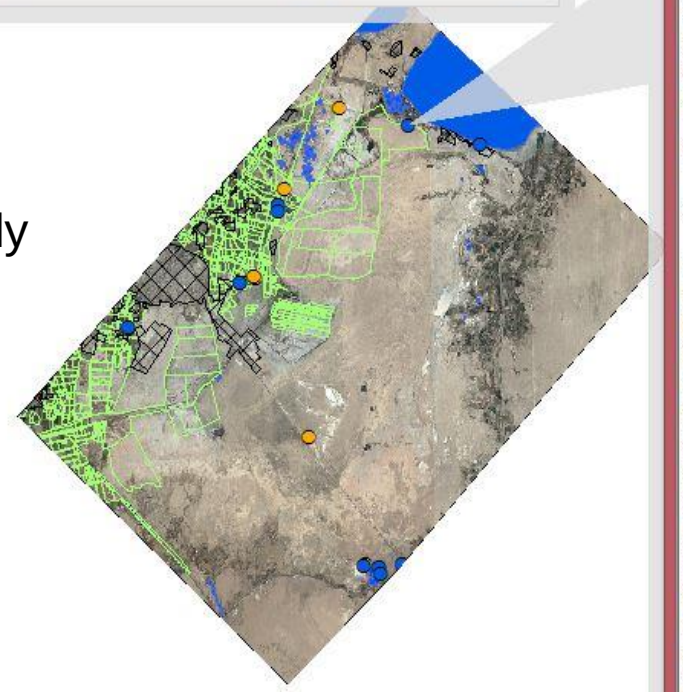
Figure . Location of the two test sites

Figure . Satellite images of the two test sites



B111-P1

Typ_of_soil	Солончак
Nomer_proba	B111-P1
N_tab_10	Солончак
Coordinats	N40 01 47.1 E64 13 46.0
Степень_засоления	Очень сильно засоленные (солончаки)
Химизм_засоления_тип	Хлоридно-сульфатный
Кислотно_щелочные_свойства_почв	Нейтральная
N_tab_9	B111-P1
pH	6,80
Сухой_остаток	2,120
NO2_prot	<1*10-6%
HCO3	0,067
Cl	0,372
SO4	0,976
NO3	0,070
Ca	0,115
Mg	0,134
K	0,008
Na	0,368
NH4	0,002



Typ_water	Поливная вода
Name_of_sorse_water	<Null>
Al	3,10
Cr	1,40
Mn	0,250
Ni	2,70
Cu	2,80
Zn	1,30
Se	1,50
Sr	1400
Mo	3,00
Cd	0,020
Hg	0,001
Pb	0,037
U	4,40
PDK_Al	200
PDK_Cr_As	50
PDK_Mn_Ni	100
PDK_Cu	1000
PDK_Zn	3000
PDK_Se	10
PDK_Sr	7000
PDK_Mo	250
PDK_Cd_Hg	1
PDK_Pb	30
Категория_вод	Воды с относительно повышенной минерализацией
Хим_состав_вод	Сульфатно-хлоридно-гидрокарбонатная кальциево-магниево-натриевая
Fe_2_мг_л	<0,1
Fe_3_м_л	<0,1
NH4_мг_л	<0,1
NO3_мг_л	3
NO2_мг_л	<0,01
N_tab_15	B201
CO3_мг_л	нет
HCO3_мг_л	134
Cl_мг_л	160
SO4_мг_л	160
Ca_мг_л	1
Mg_мг_л	55
Na_мг_л	95
K_мг_л	4
Минерализация_мг_л	860

Data was collected from totally **39 sampling points** for comprehensive analysis of soil and water content from site 1 and site 2

More thoughts

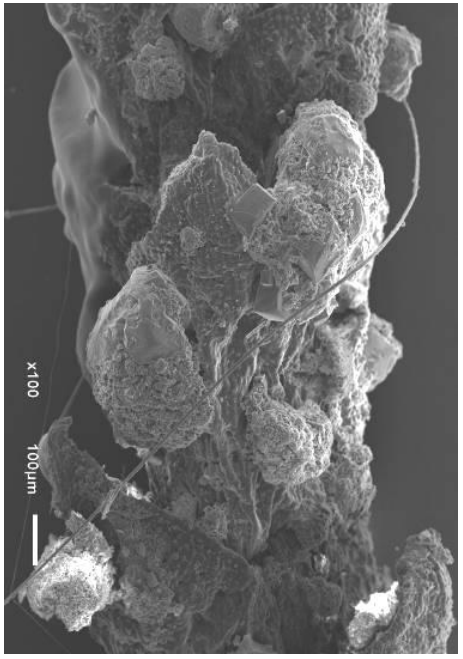
	MANAGING SALINITY $$$	LIVING WITH SALINITY $
REGIONAL and WATERSHED or GROUNDWATER BASIN SCALE	Regional Irrigation and Drainage Management	Marginalized Basin Focus on non-agricultural sectors
IRRIGATION DISTRICT	Reclamation Drainage Salt extraction Salinity prevention	Shifting ag systems * Grazing * Biosaline agriculture * Agro-forestry
FIELD SCALE		

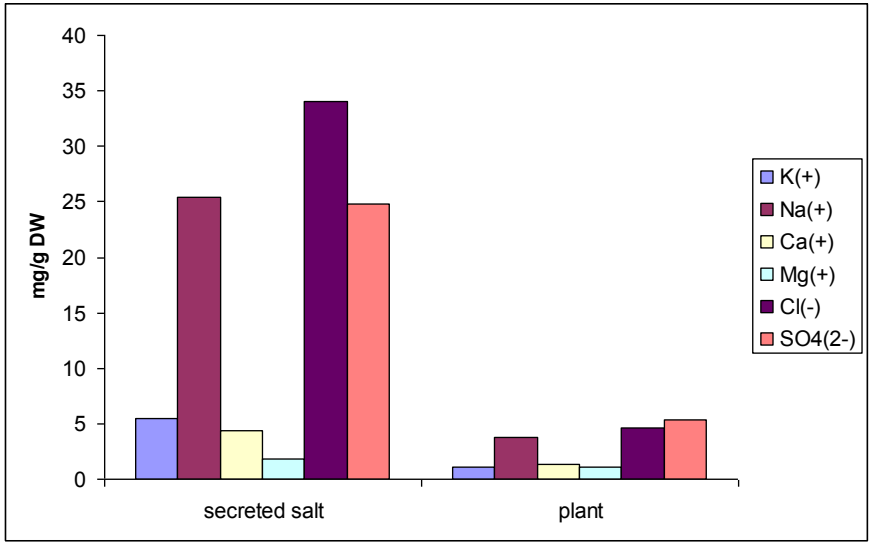
I Strategy : Coping with Salinity

Tamarix forest- invasive or Useful Raw Materials

(natural Indicators towards pastoralism current dominated system)

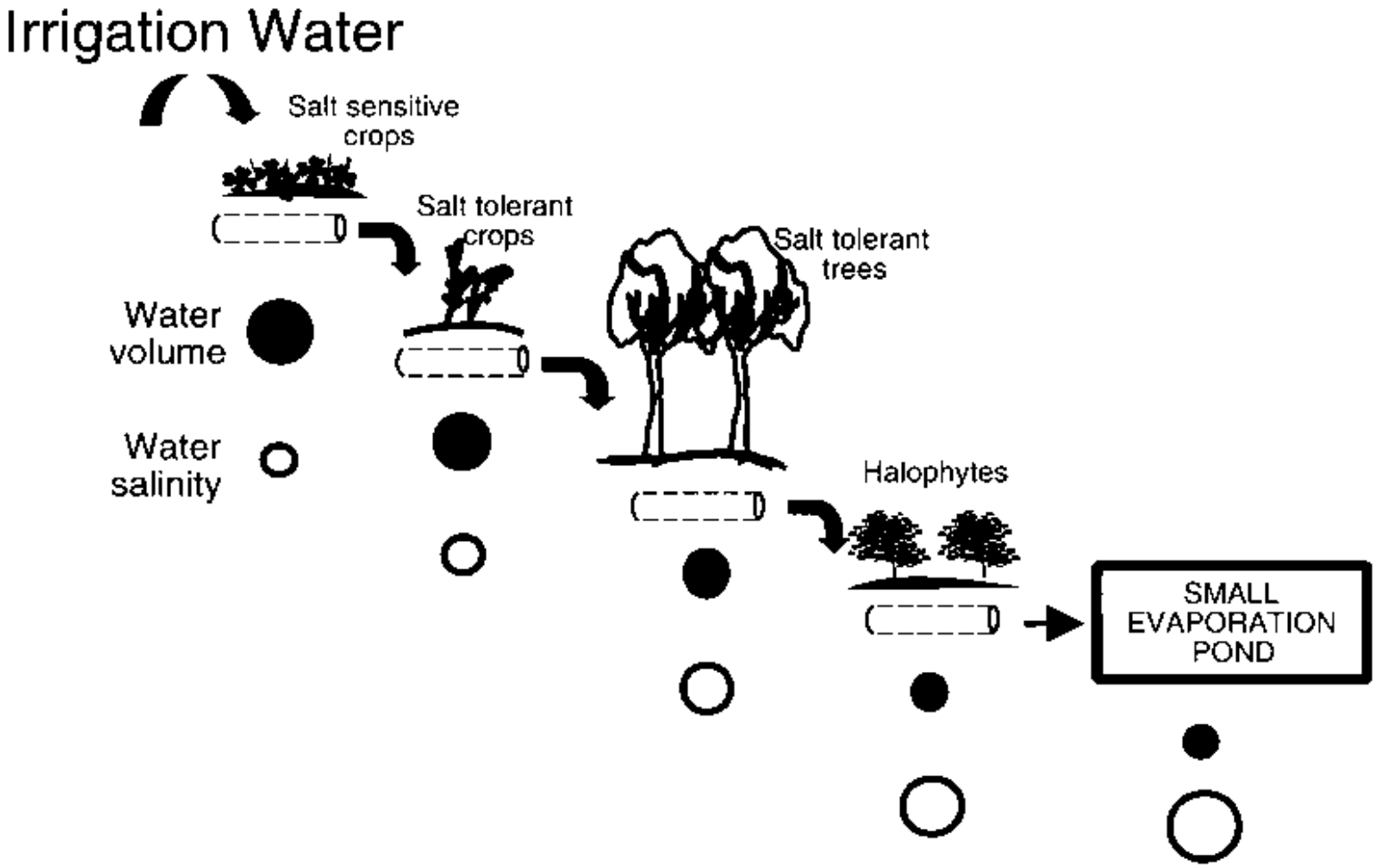
Potential of bioenergy sources





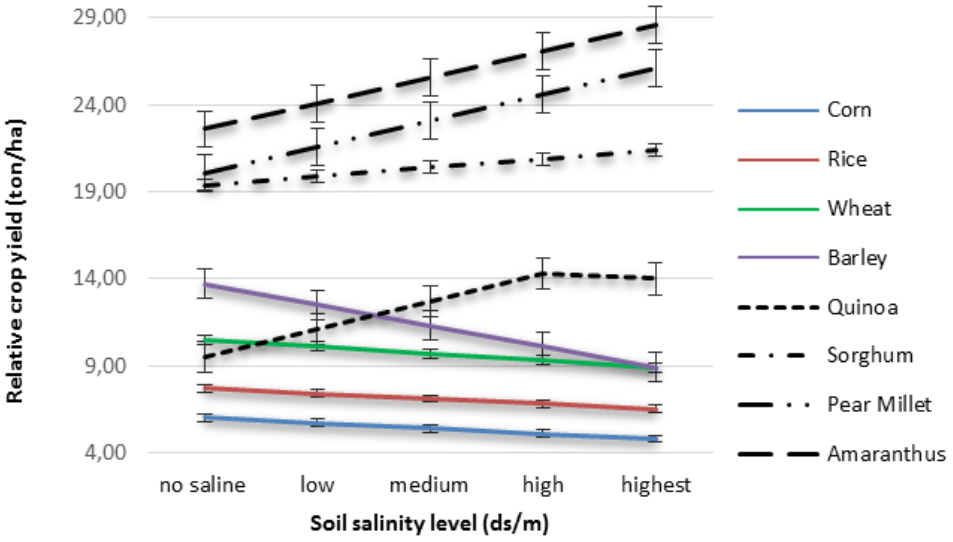
Cl > SO4 & Na > K > Ca > Mg

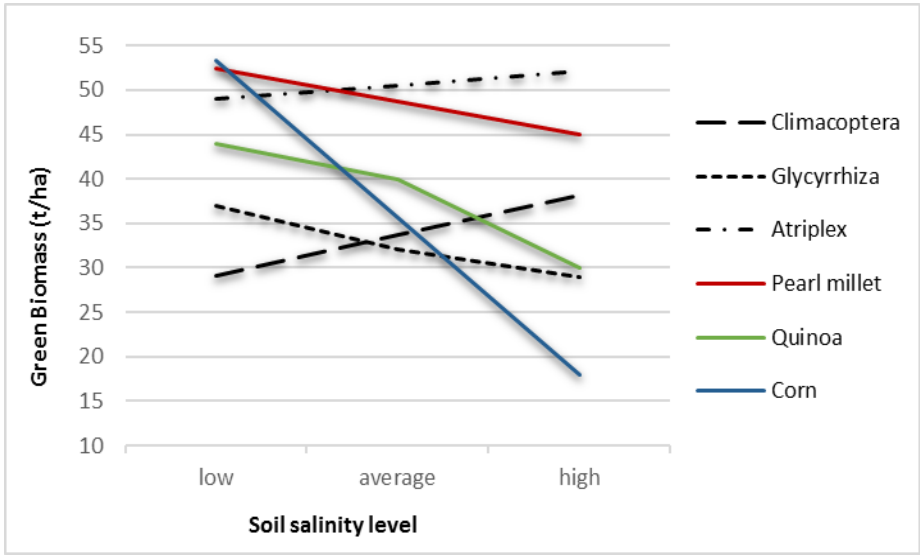
Strategy 2: Management Salinity
Serial Biological Concentration



Salinity – Impact on yields of major crops

- Major food staples cultivated in CA are salt-sensitive – especially maize, rice, wheat, barley etc. (yield losses range from 20-40%)





Ecological Raw:

- Corn < rice < wheat < barley < quinoa < pearl millet < amarantus < atriplex-succulent halophytes

Using NCR to improve agricultural production and environmental quality

- Feasibility of use of non-conventional water sources (hot artesian saline ground water and mineralized lake water) to grow halophytes and salt tolerant underutilized crops on marginal soils
- Livestock forage potential of halophytes and salt tolerant crops ;livestock feeding system & diets for small desert ruminants available;
- Alternative crops tolerant to salinity levels for multi-purpose use (diversification of human diets/ nutrition, commercial compounds& environmental quality)

http://drylandsystems.cgiar.org/news-opinions/rural-women-empowered-knowledge-improve-own-livelihoods

“Bright Spot” multi-agriculture Production Systems (IMProSys) at Qutlimurad Panaev site

Saline under groundwater
> 30 gr/l

Desalinization unit

Byproduct processing

<2,,2 g/l

In collaboration with ICBA …

UP- & OUT -SCALING to What Extend?

Transboundary Watersheds District	Village Household Makhalla

Multi-stage **phytoremediation** technology :plantations of dwarf sunflowers after licorice

Industrial plantations of pearl millet under legume cover **(crop diversification)**

Prepared terrace for planting pear cultivar Regel, hawthorn and bitter almond

Water harvesting of natural precipitation at household level

Women Rural Learning Alliance in Koybak agro-livestock cooperative

Source: KristinaToderich, Nanduru Rao & Ismail Shoaib, Annual Report,2015 , ICBA, Dubai, UAE *

Testing advanced breeding lines and working towards the adoption of new improved crop varieties continued to be key activities

Selected self-pollinated population HASHAKI 1 has been selected from salt tolerant improved line HHVBC Tall from ICBA.

This sorghum cultivar -early maturing (95-115 days), with higher yield, large size grain, resistant to soil and irrigation water salinity

Perennial sorghum and pother perennial multi-cutting grain cereal: In 2016 –new variety of sorghum **AZAMAT variety** was created for reclamation saline lands

Participatory community based approach on promotion of best biosaline practices in ARB

Empower Local Communities to Participate in Planning and Implementation of Interventions

Local Governance &
Regional Knowledge Sharing Platform

Dissemination

A unique Center of Excellence looking at Agriculture for Tomorrow

Thank you!

For more information and ICBA publications visit
www.biosaline.org

International Center for Biosaline Agriculture (ICBA) is an international, non-profit organization that aims to strengthen agricultural productivity in marginal and saline environments through identifying, testing and facilitating access to sustainable solutions for food, nutrition and income security.